MINOS Control Room Computing

Operational Description and Support

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Overview

The Minos Control room is currently located on the 12th floor of Wilson hall and is in a shared space with other Intensity Frontier (IF) experiments. The control room serves as the central point from which monitoring and control and general operations of the Minos near and far detectors are conducted.

The MINOS collaboration conducts operations shifts directly from the Wilson Hall Control Room, but has the ability to also access and control the detector from remote locations via gateway machines that are located in the Wilson Hall Control Room. In addition to the Wilson Hall facility, the MINOS detectors can be monitored and operated from a separate control room facility that is located at the Far Detector site. Due to the restrictions of the remote site, this facility is only staffed at an 8x5 level.

The DAQ computing resources that acquire data from the Minos detectors are geographically local to each detector. In the current Minos detector setup the Near detector computing is located in the underground Minos cavern which is located at the end of the NuMI beam line at FNAL. The Far detector computing is located in the underground cavern that houses the Minos far detector at the Soudan mine in Soudan Minnesota. Under the current Minos data acquisition (DAQ) model, Data logging at the near and far detectors is not directly tied to the control room systems and can continue independent of these systems. The Control Room systems at Wilson Hall interact with the primary DAQ systems at each site through a set of network gateway systems that provide a bridge/firewall between the critical and non-critical components of the experiment.

The Wilson Hall Minos control room computers are connected to the standard Fermilab public network. Each machine is configured as a standard workstation running a modern Scientific Linux Fermi operating system. In addition to their base configuration, the computers are configured to run a number of specialized processes and to serve as gateways to the DAQ computing. Currently the control room computers provide:

1. A web server for the Minos experiment.
2. A JIRA based issue reporting and tracking system.
3. The JAS beam monitoring application.
4. The data quality monitoring processes.

The computers are, as mentioned previously, also configured as secure gateways for permitting access from offsite for the purpose of running remote shift operations.

System Users

Shift/Operations access to the control room machines use a single Minos group account. The group account has been assigned a special use Kerberos principle, and remote access to the control room machines is authenticated either through this principle or the inclusion of appropriate user identities in the account's .k5login file. The access list as defined by the .k5login file is maintained by the Minos experiment and it distributed to each of the control room machines to provide uniform access to each of the machines.

The Minos control room machines have no private user accounts, and do not use any type of external systems to define user information. The machines are not part of any NIS domain and do not have any additional local accounts.

In the current Minos control room model, a limited number of identified "experts" have privileged [root] access to the control room machines. This access allows them to configure, run diagnostics and restart the servers that are hosted from these machines.

Hardware Configuration

The majority of the Minos control room computers are Dell Precision 670 systems [circa 2007]. The systems are configured with two to four monitors and run in a spanning desktop configuration.

The hardware configurations for each machine have been recorded and maintained. They are available in a printed [hardcopy] format.

Software Configuration

In the current Minos computing model, no file systems are shared between control room machines. The duplication of common files across the control room machines is accomplished via network file transfers using the rsync utility.

Each control room system features a minos group account home directory that contains a set of scripts which are used to start and stop

DAQ services. These scripts are crucial for user interaction with the Minos DAQ and should be backed up and preserved across system maintenance and updates. In the current computing model these files are archived to an area in the AFS. John Urish currently maintains the archives.

All other files that reside in the home directory on the Minos control room machines are considered temporary or non-persistent and do not require backup or archival copies.

In the current Minos control room setup, AFS areas are mounted on the control room machines. These areas were used to provide libraries for some of the applications that are run on the control room systems. The Minos offline software has moved away from using AFS as a mechanism to disseminate the software releases. A non-AFS dependent version of the software that is run on the control room machines has been demonstrated and has been detailed in the Minos RMS package documentation. The Minos will phase out the use of AFS in the fall of 2011 at which time the control room machines will no longer require any AFS mounted volumes.

All of the Minos systems run the same OS release and configuration. For historical reasons some systems had or still have special purpose roles. Those systems and roles are briefly described here:

minos-beamdata

Critical system, logs beam in formation necessary for data anlysis.

Located in FCC, for its reliable power and networking.

minos-beamdata2

Alternate beam data logger.

Administrative access to Minos Bluearc systems.

minos-gateway-nd

Critical system, provides communication to the DAQ systems.

We can take data without it for while, without monitoring or archiving.

minos-acnet

Once ran 'xhost' authorized X-windows for the ACNET console.

This now runs via an ssh tunnel, not unique to minos-acnet.

minos-evd

Once ran the prinary control room NFS server. This was retired.

Runs the interactive event display.

minos-om

Runs the control room Web server.

Acts as the gateway for ReMote Station access, for remote shifts.

Runs the Minos JIRA server.

minos-rc

Displays Run Control consoles , which could run anywhere.

minos-dcs

Windows systems, University of Minnesota responsibility.

Personnel

The operations of the Minos experiment is headed by the Minos run coordinators. The run coordinators are responsible for scheduling the day to day activities pertaining to the experiment and for decisions/tasks that affect the operations of the experiment. Scheduling of control room maintenance, upgrades or other activities that have the potential to affect the running experiment should be coordinated with the run coordinators. The current listed run coordinators are listed on the blackboard in the Wilson Hall control room and are documented electronically in the Minos memo pad, accessible at:

https://cdcvs.fnal.gov/redmine/projects/minos-memopad/wiki

Under normal operations, the Minos control room is staffed 24 hours a day, 7 days a weeks by a series of three shifts. During periods when the NuMI beam is not in operations, the staffing can and often is scaled back

to lower levels. During periods of reduced staffing the Run Coordinators are responsible for the operations of the detectors and should be the primary point of contact for scheduling work on the control room systems.

During normal running, shifts are staffed by individuals who have been trained in the basic operations of the data acquisition system. The shifters are not however experts in the full range of Minos computing systems. The shifters are provided with general procedures for starting and restarting the data taking components and can recover most systems in the event of a machine reboot.

For general safety and security, the Wilson Hall 12th floor control room is closed and locked if no personnel from any of the four experiments are present. During these periods access to the control room can be arranged either through the run coordinators for the experiments, the manager of the facilities or other authorized personnel.

Uptime Requirements

The Minos experiment is a mature experiment that is capable of operating with a very high uptime for both its detector systems and data acquisition systems. The uptime and availability of the control room computing needs to attain similar reliability so as to not affect over all data collection efficiency.

Most of the control room machines are used for monitoring purposes only, and are not essential for data acquisition and logging. Machines in this class require only an 8x5 support model with a standard 24hr response time on reported minor incidents.

Exceptions to the 8x5 support model are required for two machines which host services that are critical to the operations of the Minos experiment and who's data is required for physics analysis and normalization. The "minos-beamdata" system and "minos-beamdata2" system run copies of the experiment's beam data server. In the current computing model "minos-beamdata" is the primary server with "minos-beamdata2" acting as the secondary server to provide fault tolerance and fall-over redundancy. Currently "minos-beamdata" is hosted from the Feynman Computing Center (FCC) to provide it with a higher uptime and network availability than would be possible if the system were hosted from the Wilson Hall control room. The secondary system, "minos-beamdata2", is hosted from the Wilson Hall control room, but is only utilized for fall-over of the primary. In the current Minos model these systems have 24x7 support.

In the current Minos computing model, updates to the control room systems are performed through a two stage system. General updates to system software are handled through automatic and automatic package management system (currently auto-yum) while any updates that require a system reboot are deferred to an appropriately scheduled period. Due to the nature of the NuMI beam lines, maintenance days for the accelerator systems are regularly scheduled well in advance of the actual downtime. This often permits general updates, reboots and maintenance of the control room computing to be performed in parallel to the accelerator down time, and not cause an adverse disruption to the experiment. Maintenance periods of these types should be coordinated with the Minos run coordinators and work scheduled as appropriate.